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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/521,356

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Milo Sebastian Peter Shaffer

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EXAMINER

VETERE, ROBERT A

ART UNIT

PAPER NUMBER

1792

MAIL DATE

DELIVERY MODE

12/14/2009

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/521,356	Applicant(s) SHAFFER ET AL.	
	Examiner ROBERT VETERE	Art Unit 1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 October 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,7-17,19,20 and 23-25 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,7-17,19,20 and 23-25 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>10/21/09</u> . | 6) <input type="checkbox"/> Other: _____ |

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DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 10/13/2009 has been entered.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 1, 7-17, 19-20 and 23-25 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 1 contains the limitation that the catalyst is not pre-treated with hydrogen gas. There is no support in the specification for this limitation.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1, 7-13, 15-16, 19 and 24 rejected under 35 U.S.C. 103(a) as being unpatentable over Resasco et al. (US 6,333,016) in light of Weidenkaff et al. (Mat. Sci. Engr. C 19, pp. 119-123, 2002) and Kawakami et al. (US 2003/0086859).

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Claims 1, 7-13, 19 and 24: Resasco teaches a continuous (5:67) method of producing carbon nanotubes comprising the steps of: coating carrier particles, such as silica and alumina (5:30-35) with a thermally decomposable catalyst, such as a bimetal catalyst comprising cobalt and molybdenum (4:52-65; 5:25-30), decomposing the metal salt catalyst to yield carrier particles coated with the catalyst (5:25-30), flowing a carbon-containing gas, such as methane, acetylene or CO, over the particles (5:50:61) to yield nanotubes (5:62-6:18), such as single walled nanotubes (6:7-18) and collecting the formed nanotubes (6:7-18).

What Resasco fails to teach is that the metal salt is formate or oxalate and that the particles are fluidized. Weidenkaff teaches a method of forming carbon nanotubes from a catalyst which is deposited on metal oxide carrier particles (Abst.) wherein the catalyst is iron, cobalt or nickel oxalate and the catalyst is decomposed to coat the carrier particles (p. 120, Col. 1) by suspending the catalyst coated carrier particles in a fluidized bed and exposing the particles to a carbon containing gas to yield nanotubes (p. 120, both columns). Furthermore, Weidenkaff does not teach that the catalyst coated particles are pre-treated with hydrogen gas as the only "pre-treatment" taught by Weidenkaff is air (p. 120, col. 1). The selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used nickel, iron or cobalt oxalate in the method of Resasco with the predictable expectation of successfully forming carbon nanotubes.

With respect to the limitation that the particles are collected by elution, Kawakami explains that elution is a technique known to those of ordinary skill in the art for collecting nanoparticles (§ 0162, e.g.). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have collected the nanoparticles by elution because elution is well known in the art at the time of the invention as a means for collecting nanoparticles with the predictable expectation of success.

Claims 15-16: Weidenkaff also teaches that the oxalate is decomposed at 350°C in air (p. 120, col. 1).

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6. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Resasco, Weidenkaff and Kawakami in light of Mandeville et al. (US 5,500,200).

Claim 14: Resasco teaches the use of alumina or silica as the carrier particles, but fails to expressly teach whether they are in the form of fumed powders. Mandeville teaches a method of forming carbon fibrils using fumed alumina as a carrier particle for the metal catalyst (3:22-43). The selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have selected fumed alumina particles as the type of alumina particle used in Resasco with the predictable expectation of success.

7. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Resasco, Weidenkaff and Kawakami in light of Tennent et al. (US 5,165,909).

Claim 17: Weidenkaff fails to teach that the iron oxalate used as the catalyst is decomposed at a temperature greater than 350°C. Tennent, however, teaches a method of forming carbon nanotubes wherein iron oxalate is used as the metal salt for forming the catalyst and wherein the iron oxide is decomposed at a temperature of less than 1200°C (8:1-10). In the case where the claimed ranges overlap or lie inside ranges disclosed by the prior art” a prima facie case of obviousness exists. In re Wertheim, 541 F.2d 257, 191 USPQ 90 (CCPA 1976). Furthermore, a range can be disclosed in multiple prior art references instead of in a single prior art reference depending on the specific facts of the case. *Iron Grip Barbell Co., Inc. v. USA Sports, Inc.*, 392 F.3d 1317, 1322, 73 USPQ2d 1225, 1228 (Fed. Cir. 2004). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have decomposed the iron oxalate in the combined method of Resasco, Weidenkaff and Kawakami at a temperature between 350-1200°C, such as between 600-1000°C with the predictable expectation of success.

8. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Resasco, Weidenkaff and Kawakami in light of Resasco et al. (US 6,955,800, hereinafter “Resasco II”).

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Claim 20: Resasco II teaches a method of forming carbon nanotubes wherein catalytic particles are exposed to a carbon source gas to form the nanotubes (3:59-4:19). Resasco II explains that the carrier particles are impregnated with the catalytic metal compound. Resasco I, however, also teaches that zeolites can be used as the catalyst material (5:30-:35), which are highly porous and usually used to impregnate porous structures. The selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have impregnated the carrier particles with the catalyst, as taught by Resasco II, in the method of Resasco in order to have improved the economy of the nanotube forming process.

9. Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Resasco, Weidenkaff and Kawakami in light of Kohlen et al. (US 6,290,775).

Claim 23: Resasco and Tennent II teach all the limitations of claim 23 except that the reaction occurs on an inclined surface. Kohlen explains that it is well known in the art that a fluidized bed reactors can be arranged vertically or at an angle (1:20-23). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have arranged the fluidized bed reaction of the combined method of Resasco and Tennent II on an incline, as taught by Kohlen, with the predictable expectation of success because it is well known in the art to use an inclined fluidized bed for a reaction.

10. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Resasco, Weidenkaff and Kawakami in light of Xu et al. (US 5,973,444).

Claim 25: Resasco teaches that the carrier particles are silica, as discussed above, but fails to teach that the catalyst precursor is nickel formate. Weidenkaff teaches the use of nickel oxalate, as discussed above. Xu teaches that nickel formate can be used in the place of nickel oxalate as the catalyst precursor for forming carbon nanotubes (8:32-44). The selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945). Thus, it would have been obvious to one

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of ordinary skill in the art at the time the invention was made to have selected nickel formate in the place of nickel oxalate with the predictable expectation of success.

Response to Arguments

11. Applicant's arguments filed 10/13/2009 have been fully considered but they are not persuasive.

Applicant first argues that the specification contains support for the limitation that the catalyst is not pre-treated with hydrogen because example 3 does not use hydrogen, but example 4 repeats example 3 and includes hydrogen. This is not persuasive. Example 4 incorporates hydrogen gas into the carbon source gas. This is a concurrent treatment, not a pre-treatment, as claimed in the newly amended claim 1. Therefore, applicant has not demonstrated that the specification describes the claimed invention in sufficient detail that one skilled in the art can reasonably conclude that the inventor had possession of the claimed invention.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Applicant also argues that one of ordinary skill in the art would not look to Kawakami in combination with Resasco because Kawakami teaches a reaction at a much higher pressure. This is not persuasive with respect to the limitation dealing with elution. Kawakami explains that it is well known in the art that elution can be used to collect nanoparticles. Even if Kawakami teaches a method which is performed at a higher pressure than Resasco, one of ordinary skill in the art would still understand that elution could be used to collect the nanoparticles after the method of forming said nanoparticles had been completed.

Applicant's arguments with respect to the Leiber reference, the Tennant references as they relate to hydrogen pre-treatment and the Kawakami reference as it relates to the type of metal compound used have been considered but are moot in view of the new ground(s) of rejection.

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Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ROBERT VETERE whose telephone number is (571)270-1864. The examiner can normally be reached on Mon-Fri 9-6.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on 571-272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Robert Vetere/
Examiner, Art Unit 1792

/Michael Cleveland/

Supervisory Patent Examiner, Art Unit 1792